

**NAME**

BN\_mod\_mul\_reciprocal, BN\_div\_recp, BN\_RECP\_CTX\_new, BN\_RECP\_CTX\_free, BN\_RECP\_CTX\_set - modular multiplication using reciprocal

**SYNOPSIS**

```
#include <openssl/bn.h>
```

```
BN_RECP_CTX *BN_RECP_CTX_new(void);  
void BN_RECP_CTX_free(BN_RECP_CTX *recp);
```

```
int BN_RECP_CTX_set(BN_RECP_CTX *recp, const BIGNUM *m, BN_CTX *ctx);
```

```
int BN_div_recp(BIGNUM *dv, BIGNUM *rem, const BIGNUM *a, BN_RECP_CTX *recp,  
                BN_CTX *ctx);
```

```
int BN_mod_mul_reciprocal(BIGNUM *r, const BIGNUM *a, const BIGNUM *b,  
                          BN_RECP_CTX *recp, BN_CTX *ctx);
```

**DESCRIPTION**

**BN\_mod\_mul\_reciprocal()** can be used to perform an efficient **BN\_mod\_mul(3)** operation when the operation will be performed repeatedly with the same modulus. It computes  $r=(a*b)\%m$  using **recp**=1/**m**, which is set as described below. **ctx** is a previously allocated **BN\_CTX** used for temporary variables.

**BN\_RECP\_CTX\_new()** allocates and initializes a **BN\_RECP** structure.

**BN\_RECP\_CTX\_free()** frees the components of the **BN\_RECP**, and, if it was created by **BN\_RECP\_CTX\_new()**, also the structure itself. If **recp** is NULL, nothing is done.

**BN\_RECP\_CTX\_set()** stores **m** in **recp** and sets it up for computing 1/**m** and shifting it left by **BN\_num\_bits(m)+1** to make it an integer. The result and the number of bits it was shifted left will later be stored in **recp**.

**BN\_div\_recp()** divides **a** by **m** using **recp**. It places the quotient in **dv** and the remainder in **rem**.

The **BN\_RECP\_CTX** structure cannot be shared between threads.

**RETURN VALUES**

**BN\_RECP\_CTX\_new()** returns the newly allocated **BN\_RECP\_CTX**, and NULL on error.

**BN\_RECP\_CTX\_free()** has no return value.

For the other functions, 1 is returned for success, 0 on error. The error codes can be obtained by **ERR\_get\_error(3)**.

#### SEE ALSO

**ERR\_get\_error(3)**, **BN\_add(3)**, **BN\_CTX\_new(3)**

#### HISTORY

**BN\_RECP\_CTX\_init()** was removed in OpenSSL 1.1.0

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